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The first chapter describes the "principal groups of plants," in which types are selected to represent the groups. The descriptions are systematic in form, encyclopedic in content, and entirely unrelated. Just what the student is expected to do with this part is not clear. There follow chapters on the "outer morphology of angiosperms" and "the inner morphology of the higher plants." This old breaking-up of a subject that cannot be broken is artificial in the highest degree. The confusion is increased by referring to the first topic as "the anatomy or outer structure of the angiosperms;" and to the second as "the inner structure or histology of the higher plants." This may be what students of pharmacy need, but it is not modern botany.

The remaining chapters deal with the professional details of pharmacy; although under Part I, which bears the title "Botany," there appear chapters on the "classification of angiosperms yielding vegetable drugs," and "cultivation of medicinal plants." Part II is entitled "Pharmacognosy" and contains chapters on crude drugs, powdered drugs, and foods. Part III is devoted to "reagents and microscopical technique."—J. M. C.

NOTES FOR STUDENTS

Synopsis.—GRÉGOIRE has published³ an interpretation of synopsis opposing HERTWIG'S new theory and confirming his own earlier view. He states that the nucleus in synopsis passes through three principal states (*leptotènes*, *pachytènes*, *strepsitènes*), and that synopsis represents a primary state of heterotypic prophase. He says that cytologists diverge into two schools: one believing that the pre-reduction of chromosomes occurs in the zygonema stage, the bivalent chromosomes in the strepsinema stage representing the paired true chromosomes in heterotypic mitosis; the other believing that the pre-reduction is effected by a folding back, in the strepsinema stage, of a chromosome which is believed to be composed of two somatic chromosomes attached end to end. However, they all agree in considering synopsis as a stage in the development of the heterotypic chromosomes.

Taking WOLTERECK'S conception, R. HERTWIG proposed an entirely new interpretation of synopsis, deduced from his theory of nucleoplasmic relation. The gist of the theory is this: increase of protoplasm cannot continue without an intervention of nuclear division which may or may not be followed by cell division. After cell division, the increase of protoplasm and of nucleus cannot proceed equally, the former generally being ahead of the latter; so the nucleoplasmic quotient (K/P) tends to diminish. HERTWIG designates the state of equilibrium as "nucleoplasmic tension." This tension causes a sudden and considerable increase of the nucleus, which results in the increase of chromatin. The increase of protoplasm and consequent increase of chromatin can be brought back to equilibrium only by nuclear division. Applying the theory to the nuclear division in tetradogeneses (sporogenesis, spermatogenesis, and ovogenesis), he

³ GRÉGOIRE, VICTOR, Les phénomènes de l'étape synaptique représentent-ils une cariocinèse avortée? La Cellule 25:87-99. 1908.

found an objection, especially where a considerable increase of the ovocyte is not followed directly by nuclear division. For the sake of harmonizing the theory with the phenomena, he suggested that synapsis is really an abortive division. This theory of synapsis naturally tends to interpret synapsis not as a stage preparing for the heterotypic chromosomes, but only as an abortive form of nuclear division. The work of POPOFF on ovogenesis of *Paludina* is the material on which the theory is based. POPOFF apparently considers the bivalent chromosomes after synapsis and before the growth period in ovogenesis of *Paludina* as tetrads. These chromosomes completely disorganize in the diplonema stage, and the heterotypic chromosomes which appear after the growth period are a new formation, without any connection with the chromosomes that emerged from synapsis. Moreover, WASSILEIFF considers that in spermatogenesis of *Blatta* there occurs a pulverization of chromosomes during synapsis, and he believes that it is a trace of abortive nuclear division.

GRÉGOIRE remarks, under the headings spermatogenesis, sporogenesis, and ovogenesis, that such an interpretation cannot be in harmony with the vast majority of cases of synapsis, which are believed to be an important stage in the preparation of heterotypic chromosomes. In conclusion, he emphasizes synapsis as a fundamental stage, which constitutes a primary state of heterotypic prophase and not as an abortive kinesis.—SHIGÉO YAMANOUCHI.

Soil fertility.—The Bureau of Soils is doing an excellent work in seeking the explanation of the differences in productiveness of soils along the lines of a rational physiology. In spite of various attacks upon the principles which they are developing, the work commends itself to the unprejudiced as consonant with the modern phases of physics and physiology. Two recent bulletins contain valuable reports of research. CAMERON and GALLAGHER have shown⁴ that when water has been added to a given soil in such proportion that it is in its most favorable condition for working and for plant development (as determined by expert gardeners), this is also the condition when to a pointed instrument it is physically most penetrable. This "optimum" water content varies with different soils from 4 per cent. (sandy) to 120 per cent. (muck). The apparent specific gravity or volume, the rate of evaporation, and some other physical features are also definitely related to the moisture content, changing in a marked way as the optimum water content is passed. It is also shown that the optimum moisture does not vary with the plant, but what is best for one plant is best for another in a given soil. Probably the penetrability of the soil is the important factor, since roots are thus able to reach their maximum development, and so to offer the largest possible surface for the admission of water.

Another bulletin, by GARDNER,⁵ reports a vast number of experiments on

⁴ CAMERON, F. K., and GALLAGHER, F. E., Moisture content and physical condition of soils. U. S. Dept. Agric., Bureau of Soils, Bull. 50. pp. 70. figs. 33. January 31, 1908.

⁵ GARDNER, F. D., Fertility of soils as affected by manures. *Idem*, Bull. 48. pp. 59. figs. 5. March 21, 1908.